

## CLAIMS

1. A method for the purification of a volatile metal hydride comprising
  - (a) obtaining a volatile metal hydride feed containing one or more acidic impurities, one of which is a sulfur-containing impurity;
  - 5 (b) contacting the feed with an alkaline material and reacting at least a portion of the sulfur-containing impurity with the alkaline material to remove the portion of the sulfur-containing impurity from the feed and provide an intermediate purified material; and
  - 10 (c) contacting the intermediate purified product with an adsorbent material to remove at least a portion of the sulfur-containing impurity from the intermediate purified material and provide a purified volatile metal hydride product.
2. The method of Claim 1 wherein the volatile metal hydride feed contains an acidic impurity which does not contain sulfur.
- 15 3. The method of Claim 2 wherein the acidic impurities comprise hydrogen sulfide and carbon dioxide.
4. The method of Claim 1 wherein the volatile metal hydride feed comprises one or more  
20 compounds selected from the group consisting of arsine, phosphine, and germane.
5. The method of Claim 1 wherein the contacting of the feed with an alkaline material is effected at a sub-ambient temperature.
- 25 6. The method of Claim 1 wherein the alkaline material comprises one or more compounds selected from the group consisting of sodium hydroxide, potassium hydroxide, and tetraalkyl ammonium hydroxide.

7. The method of Claim 1 wherein the adsorbent material comprises one or more adsorbents selected from the group consisting of type 4A zeolite, type 5A zeolite, type 13X zeolite, and activated alumina.

5 8. The method of Claim 6 wherein the alkaline material is an aqueous solution of one or more alkaline compounds.

9. The method of Claim 8 wherein the intermediate purified material is contacted with a desiccant material prior to contacting with the adsorbent material.

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10. A purified volatile metal hydride product made by the method comprising

(a) obtaining a volatile metal hydride feed containing one or more acidic impurities, one of which is a sulfur-containing impurity;

15 (b) contacting the feed with an alkaline material and reacting at least a portion of the sulfur-containing impurity with the alkaline material to remove a portion of the sulfur-containing impurity from the feed and provide an intermediate purified material; and

20 (c) contacting the intermediate purified product with an adsorbent material to remove at least a portion of the sulfur-containing impurity from the intermediate purified material and provide the purified volatile metal hydride product.

11. The purified volatile metal hydride product of Claim 10 wherein the acidic impurities comprise hydrogen sulfide and carbon dioxide.

25 12. The purified volatile metal hydride of Claim 10 wherein the volatile metal hydride feed comprises one or more compounds selected from the group consisting of arsine, phosphine, and germane.

30 13. The purified volatile metal hydride of Claim 10 wherein the contacting of the feed with an alkaline material is effected at a sub-ambient temperature.

14. The method of Claim 10 wherein the alkaline material comprises one or more compounds selected from the group consisting of sodium hydroxide, potassium hydroxide, and tetraalkyl ammonium hydroxide.

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15. The purified volatile metal hydride of Claim 14 wherein the alkaline material is an aqueous solution of one or more alkaline compounds.

10 16. The purified volatile metal hydride of Claim 15 wherein the intermediate purified material is contacted with a desiccant material prior to contacting with the adsorbent material.

17. A system for the the purification of a volatile metal hydride feed comprising

15 (a) a first vessel containing an alkaline material, wherein the vessel is adapted for contacting the volatile metal hydride feed with the alkaline material, the feed containing one or more acidic impurities, one of which is a sulfur-containing impurity, wherein at least a portion of the sulfur-containing impurity is reacted with the alkaline material to remove the portion of the sulfur-containing impurity from the feed and provide an intermediate purified material; and

20 (b) a second vessel containing an adsorbent material, wherein the vessel is adapted for contacting the intermediate purified product with the adsorbent material to remove at least a portion of the sulfur-containing impurity from the intermediate purified material and provide a purified volatile metal hydride product.

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